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Alternatives to the Shelflist Measure for Determining the Size of a Subject Collection

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The effective management of academic library collections has relied for some years on a rough knowledge of the number of titles published, acquired, or held in each of the academic disciplines. One standard technique for obtaining this information had been to equate certain class numbers in the Dewey or LC classification schedules to specific academic disciplines and then to count the number of titles in a collection which have been assigned that range of numbers.¹ When applied to library holdings, this method is known as a shelflist count. The purpose of this study is to demonstrate that in many cases such a technique may be highly inaccurate, and to suggest alternative techniques for obtaining the needed information.

There is not a patron of academic libraries who has not puzzled over the classification given to books in his or her own discipline. Emmanuel LeRoy Ladurie's *Peasants of Languedoc* (1974) was written by an historian, reviewed in various historical journals, and read and cited mostly by other historians. Dewey classified it under general agriculture (338.1); LC did a better job, classifying it with land history (HD649). In the eyes of patrons, often experts in their fields, these are misclassifications.

If one were to take a sample of titles in a given discipline, selected by experts as titles belonging to that discipline, what percentage of the Dewey and LC class numbers assigned to them would fall within the class numbers usually reserved for that discipline? This was the problem faced by the Purdue University humanities and social sciences liaison librarians as they undertook a project to determine the number of titles held in each of the humanities and social science disciplines by the Purdue University Libraries. Every librarian knows that not every book in the field of history will be classified in the Dewey class numbers 900 to 909, 930 to 999, or in the LC schedules C, D, E, or F. But, would it even be safe to assume that 80 percent of all titles which a professional historian would consider to be in this field would be classified in this range of numbers? If not, then any measure of the shelflist would not be even a good approximation of subject collection size.

In order to test the reliability of a shelflist count as even a rough measure of subject collection size, the authors decided to establish a sample of titles for each of five subject areas, and to determine the frequency with which the class numbers assigned them by Dewey and LC placed them in classification schedules related to their subject.

THE SAMPLE

An unbiased sample was selected for each of five subjects. Each sample was designed to be representative of the books which are in the Purdue University Libraries and which fall within a discipline as defined by the practitioners of that field.

Finding an unbiased sample required great care. A list drawn from *Books for College Libraries* would clearly be unacceptable because in it titles in each discipline are defined by their classification number. Bibliographies by specialists in various fields were too often biased toward a subspecialty of the field, e.g., a bibliography on existential philosophy. Titles drawn from the book review section of a journal in the field are biased toward recent items on the subject. These biases may be rectified in a number of ways, but the authors found one sampling method to be particularly useful:

1. A first sample was drawn from a standard review journal which reviews books in all the sub fields of a subject. Examples of this type of journal are the *American Anthropologist*,

- the *American Historical Review*, and the *American Sociological Review*. The books reviewed in these journals offer a selection of titles representative of the discipline as defined by its practitioners, and do not have a bias toward any subfield of the discipline.
2. In order that the particular issues chosen for the sample do not represent a bias by date of imprint, the authors used an independent sample to determine the median date of publication for books in the field under investigation held by the Purdue Libraries. They then selected half the sample from journal issues prior to that date and half from issues posterior to that date. This independent sample of imprint dates was drawn from the library's author/main entry catalog by selecting every tenth catalog drawer and then selecting titles one inch apart in the drawer. When a title in the field under investigation was identified by the subject specialist, its date of publication was recorded.
 3. In order to translate the sample of titles reviewed by these journals into a sample held by the Purdue University Libraries, the journal sample was checked against the holdings of the library and only those titles both reviewed in the journal and held by the Purdue Libraries were entered in the final sample.

THE RESULTS

The authors tested the disciplines of anthropology, philosophy, political science, history, and sociology. The first tests were designed to show the degree of deviation between the titles of these five disciplines and the relevant schedules used by Dewey for classifying them. In order to generalize the conclusions of the experiment, LC numbers were ascertained for all titles used in the five samples and the analysis was repeated.

Tables I and II summarize the results of the tests. In two subjects, anthropology and sociology, well over 60 percent of the samples drawn from the *American Anthropologist* and the *American Sociological Review* fell outside both the Dewey and LC class schedules commonly associated with these two disciplines. The extreme case was the sample of 254 anthropology titles, of which only 19.7 percent fell within the designated Dewey numbers. Philosophy, on the other hand, was classified rather well by the Dewey and LC schedules. Neither LC or Dewey excluded more than 35 percent of the sample in this field. The other two subjects, history and political science, gave mixed results. Only 31.5 percent of the sample of 352 titles drawn from the *American Historical Review* were given appropriate class numbers by Dewey. In the case of political science, just the reverse occurred when 68.7 percent of the sample received recognizable "political science" class numbers in Dewey, but only 52.9 percent were given the relevant LC classifications.

ALTERNATIVES TO THE SHEFLIST COUNT

These results suggest that a shelflist count misses anywhere from 30 to 80 percent of the titles in a given subject in the humanities and social sciences. The question then becomes one of how to correct for this undercount. The authors devised and utilized two methods for this purpose.

Method I

The first method may be described as a modified shelflist count. It is simply a continuation of the procedure described above. Having determined the percentage of titles on a given subject which fall within the designated classification number(s), one first measures the number of cards in the shelflist having these designated numbers, and then increases this measure by a reciprocal of the percentage of titles falling within the numbers measured.² For example, a shelflist measure of the

cards in the Dewey ranges 900 to 909, 930 to 999, and the equivalent numbers in the 016 range, indicates that the Purdue Libraries hold 22,300 titles in history, but a sample of the history titles drawn from the *American Historical Review* shows that only 31 percent of the history titles held by Purdue Libraries fall within this range of numbers. The 22,300 titles were therefore increased by a factor of $1/.31$ or 3.2 to give a total history collection of 71,900 titles. Using a .95 confidence interval to estimate the upper and lower limit of the collection size, the history collection is more accurately described as lying between 62,000 and 85,000 titles.³

Method II

A second method was devised by the authors to overcome the deficiencies of the shelflist count:

1. An expert in a particular discipline randomly selects 1,000 titles from the author/main entry catalog.
2. As an expert, he or she identifies those titles from the sample of 1,000 which belong to the discipline under study.
3. The percentage of the total sample identified as belonging to the discipline, times the total number of titles in the library, yields the number of titles held by that library in that discipline.

The basic assumption of this method is that there is no correlation between an author's last name and the subject on which he writes, that is, that books on different subjects are distributed randomly in the author / main entry catalog.

This method is particularly useful in dealing with a subject like communications. When the Dewey and LC schedules were devised, the subject of communications did not exist; it has been developed in the past 20 years as a result of the theoretical and functional similarities of a number of scattered topics. There is, therefore, no one place in either classification scheme that might be measured to give even a base figure for the collection size. This fact makes our first method, or any shelflist measuring technique, completely unsuitable.

This second method was applied in three different trials to the Purdue Libraries author/main entry catalog in order to determine the number of titles dealing with communications. Each trial gave a similar answer. The results were 13 out of 1,000 titles on the first trial, 18 out of 1,000 on the second trial, and 15 out of 1,000 titles on the third trial. Since the Purdue Libraries had about 750,000 titles (1,300,000 volumes) at that time, the size of the communications collection was calculated as follows:

$$.015 \times 750,000 = 11,250 \text{ titles in communication}$$

Here again, it would be possible to state the size of the collection in communications as falling between an upper and lower limit with a .95 confidence. In this case, the true estimated size is between 9,600 and 12,900 titles.

CONCLUSION

This study has shown that a specialist's definition of the literature of his field may differ greatly from the definition of that field provided by the Dewey or LC classification systems. In this study 30 to 80 percent of the material defined by a specialists as belonging to his or her field was not included in that field by the Dewey and LC classification systems. This means that a shelflist count is not a reliable measure of the number of titles in certain disciplines and that various sampling methods using experts' definitions of what titles are in a field are needed to correct these

measures. The alternative measuring techniques developed here are admittedly more time consuming to perform than a shelflist count, but given the possibility of a three-fold error in the use of the latter, the effort involved in the alternative methods is justified.

The choice of whether to utilize a shelflist count or one of the two alternative methods presented in this study depends, in the last analysis, on the uses to be made of the data. A library classification schedule assigns a book to only one subject, while the subject collections established by one of our alternative methods acknowledges that a single title may deal with more than one subject and consequently may be counted as a title of more than one discipline. There may be occasions when the purpose of a measure dictates that a book be assigned exclusively to one discipline, but many administrative uses of collection measurement do not require this. The two alternative methods devised for the Purdue study can be used for both intralibrary comparisons and longitudinal comparisons as long as they are applied consistently. Perhaps more relevant to the needs of the library administrator, the calculation of the number of titles in a given discipline in an academic library allows the librarian to estimate the probability that a student or faculty member doing research in that discipline will find the title he or she will need in the library. This is the figure needed by library and university administrators for purposes of accreditation and budget allocation. The discipline and reading needs of faculty and students are reflected by the books reviewed in their professional journals, not by the classification schemes used by libraries. Herein lies the strength of our alternative measuring techniques.

TABLE I

A Comparison of the Number of Titles in Five Disciplines of the Humanities and Social sciences which are Classified Either Inside or Outside the Dewey Numbers Reserved for that Discipline¹

	Anthropology		History		Political Science ²		Sociology		Philosophy	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Titles falling inside classification numbers	50	19.7%	111	31.5%	367	68.7%	212	35.3%	107	64.8%
Titles falling outside classification numbers	204	80.3%	241	68.5%	167	31.3%	390	64.7%	58	35.2%
Dewey classification numbers used	301.2 – 301.22; 390 – 398.2; 410; 571 – 573; 913.031; 913.3; 970.1 – 970.4 016.390 – 016.398; 016.571 – 016.573		900 - 909; 930 – 999; 016.90 – 016.909; 016.30 – 016.999		320 – 329; 340 – 349; 350 – 359; 923.2 – 923.5; 016.34 – 016.359		300 – 312; 360 – 369 016.30 – 016.312 016.360 – 016.369		100 – 129; 140 – 149; 160 – 199; 016.10 – 016.129; 016.140 – 016.149; 016.160 – 016.199	
Sample source	American Anthropologist		American Historical Review		Harmon, R. B. Political Science; a bibliographic guide		American Sociological Review		Philosophical Books	

1. The differences in the size of the samples used for the different disciplines reflects the size of the sampling universe and the sampling method used. Technically speaking, the samples based upon review journals were stratified cluster samples drawn from specific years and issues of the journal designed to reflect the distribution of imprint dates in the Purdue collections. The sample for political science was a systematic sample from the bibliography by Harmon. In all cases the samples were large enough to assure adequately narrow confidence intervals to meet the needs of the evaluation project.

2. The authors made an exception of the sampling procedure in the case of political science. The Liaison Librarian for political science was confident that the bibliography by Harmon offered an unbiased representation of the field of political science.

TABLE II

A Comparison of the Number of Titles in Five Disciplines of the Humanities and Social sciences which are Classified Either Inside or Outside the Library of Congress Numbers Reserved for that Discipline

	Anthropology		History		Political Science ²		Sociology		Philosophy	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Titles falling inside classification numbers	55	21.6%	215	61.1%	283	52.9%	182	30.2%	121	73.3%
Titles falling outside classification numbers	199	78.4%	137	38.9%	251	47.1%	420	69.8%	44	26.7%
Library of Congress classification numbers used	CC; GF; GN; GR; GT; HM101 – 108; LB45; Z5111-5119 Z5131 - 5134		CB; CD-CS; D-DX; E; F; HD; Z6201-6209		HX; J-JX; Z164.A2; Z7164.I8; Z7164.I6; Z7164.L8; Z7164.P3; Z7164.R4		HM; HN; HQ-HT; HV; Z7164.D3; Z7164.M2; Z7164.L53; Z7164.S68; Z7164.R12		B; BC; BD; BH; BJ; Z7125-7130	
Sample source	American Anthropologist		American Historical Review		Harmon, R. B. Political Science; a bibliographic guide		American Sociological Review		Philosophical Books	

NOTES

• A preliminary draft of this paper was presented to members of the Library Research Round Table at the annual meeting of the American Library Association, June 30, 1980, New York, N.Y.

1. There is a scarcity of material in the library literature on the use of shelflist counts as a management tool. The studies of note are W. E. McGrath, "Determining and Allocating Book Funds for Current Domestic Buying," (1967); W. E. McGrath and N. Durand, "Classifying Courses in the University Catalog," (1969); J. J. Knightly, "Library Collections and Academic Curricula: Quantitative Relationships," (1975); and R. L. Burr, "Evaluating Library Collections: A Case Study," (1979). In 1976 The Collection Development Committee of the Resources Section, Resources and Technical Services Division, American Library Association facilitated the procedure by issuing a standardized breakdown of the Library of Congress classification schedule in its "Guidelines for the Formulation of Collection Development Policies," (1977). Machlup in his recent book, *Information Through the Printed Word* (1978) III, pp. 21-36, made extensive use of the "National Shelflist Count" to draw conclusions about trends in American academic library collections. Of potential value in the use of shelflist measures is the work presently being conducted by Evans at the State University of New York. (See his *Collection Development Analysis Using OCLC Archival Tapes: Final Report* (1977).

2. The derivation of this procedure is as follows:

$$PC = S$$

$$C = 1/PS$$

where:

P = Percent of titles classified within the class numbers reserved for that discipline in a

classification schedule

C = Collection Size in number of titles

S = Shelflist count in number of titles

3. The confidence intervals were calculated using the normal approximation for the binomial parameter p.

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